The discriminative nature of morphology

Michael Ramscar

Eberhard Karls Universität Tübingen

Traditional studies of language assume atomistic model in which linguistic signals comprise discrete, minimal form elements associated with discrete, minimal elements of meaning. Since linguistic production has been seen to involve the composition of messages from an inventory of form elements, and linguistic comprehension the subsequent decomposition of these messages, researchers have focused on attempting to identify and classify these elements, and the lossless processes of composition and decomposition they support, a program that has raised more questions than answers, especially when it comes to the nature of form-meaning associations.

By contrast, behavioral and neuroscience research based on human and animal models has revealed that "associative learning" is a lossy, discriminative process. Learners acquire predictive understandings of their environments through competitive mechanisms that tune systems of internal cue representations to eliminate or reduce any uncertainty they promote. Critically, models of this process better fit empirical data when these cue representations do not map discretely onto the aspects of the environment learners come to discriminate.

In this talk, I will describe some empirical results that indicate that human communication – and in particular, the morphological structure of human communication system – is subject to the constraints that the basic principles of learning impose, and describe how, from this perspective, languages should be seen as probabilistic communication systems that exhibit continuous variation within a multidimensional space of form-meaning contrasts.

I shall begin by briefly describing how basic learning mechanisms can be used to shed light on morphology and morphological development. In particular, I shall show how linguistic claims about the absence of "negative evidence" in language learning are undermined by actual learning models, and explain how these models account for patterns of children's morphological overregularization as well as making surprising and successful predictions in this domain.

I shall then describe the view of morphology that emerges from discrimination learning, showing how forms contribute not only to the reduction of semantic uncertainty in structured ways, but also how form contrasts also form systematic structures that serve to regulate uncertainty about upcoming forms themselves.

I will then show how this approach can be used to shed light on two aspects of language that have long puzzled linguists: noun class systems (aka grammatical gender) and the semantics of personal names. I will show how noun class systems and personal name systems are not merely not random, but that each actually represents a highly structured and highly evolved morphological subsystem.

A critical aspect of these systems is the way that information is distributed across the forms that make them up. Information theory has shown that exponential distributions are beneficial to the design of efficient communication systems, because they are both optimal for coding purposes and memoryless. It has recently been shown that Sinosphere family names are exponentially distributed, and I will reveal how, consistent with this, the empirical name distributions in English are also exponential, such that the distributional structure of names appears to be universal to the world's major languages.

I further describe a set of complementary analyses that reveal how other empirical distributions of English are also exponential, a result that suggests that the Zipfian distributions long thought to play a functional role in language are an artifact of the mixing of these empirical distributions. I will then describe how these socially evolved structures serve to optimally facilitate the discriminative processes of human communication.

Finally, given that humans are linguistic animals, one might expect that a successful theory of human communication can offer insights that extend beyond linguistics. Accordingly, if time permits I will describe how the application of a discriminative theory of linguistics can shed new light on our understanding of lifespan cognitive development, and in particular, how the idea of "healthy cognitive decline" appears to be a myth that reflects a history of scientific failings in relation to our attempts to naturalize the minds we study.